

Claims

We claim:

1 1. A method for controlling the expression of a
2 gene in a living cell, comprising contacting the
3 5'untranslated region of an RNA in the cell with a cell
4 permeable, small molecule.

1 2. A method for controlling expression of a gene,
2 comprising:
3 providing an aptamer that binds specifically to a
4 cell permeable, small molecule;
5 incorporating the aptamer into a region of a gene,
6 which region encodes a 5' untranslated region of an RNA;
7 contacting the cell-permeable, small molecule with a
8 cell that contains the gene, so that the cell-permeable,
9 small molecule enters the cell and controls expression of
10 the gene.

1 3. The method of claim 2, wherein the cell
2 permeable, small molecule binds specifically to the aptamer
3 sequence in the 5' untranslated region of RNA transcribed
4 from the gene.

1 4. The method of claim 2, wherein the gene is an
2 endogenous gene.

1 5. The method of claim 2, wherein the gene is a
2 transgene.

1 6. The method of claim 2, wherein the cell is a
2 prokaryotic cell.

1 7. The method of claim 2, wherein the cell is a
2 eukaryotic cell.

1 8. The method of claim 7, wherein the eukaryotic
2 cell is a mammalian cell.

1 9. The method of claim 8, wherein the mammalian
2 cell is *in vivo*.

1 10. The method of claim 9, further comprising
2 administering the cell permeable, small molecule to the
3 mammal topically, parenterally, orally, vaginally, or
4 rectally.

1 11. The method of claim 2, wherein the cell
2 permeable, small molecule is an organic compound.

1 12. A gene comprising an aptamer sequence
2 incorporated into a region of a gene that encodes a 5'
3 untranslated region of an RNA.

1 13. A transgenic cell comprising an aptamer
2 incorporated into a region of a gene that encodes a 5'
3 untranslated region of an RNA.

1 14. The cell of claim 13, further comprising an RNA
2 transcript containing the aptamer in the 5' untranslated
3 region of the RNA transcript.

1 15. The cell of claim 14, further comprising a cell
2 permeable, small molecule that binds specifically to the
3 aptamer.

1 16. A bacterial resistance marker comprising an
2 aptamer sequence operably linked to a bacterial expression
3 control sequence.

1 17. A method for determining whether a gene of
2 interest is essential for the survival or growth of a cell,
3 comprising:

4 structurally disrupting or deleting an endogenous
5 gene of interest in the cell;

6 providing an aptamer that binds specifically to a
7 cell permeable, small molecule;

8 incorporating the aptamer into a region of the gene
9 of interest *in vitro*, which region encodes a 5' untranslated
10 region of an RNA, thereby producing a controllable gene of
11 interest;

12 introducing the controllable gene of interest into
13 the cell, thereby producing a test cell;

14 contacting the cell-permeable, small molecule with
15 the test cell, so that the cell-permeable, small molecule
16 enters the test cell and controls expression of the
17 controllable gene of interest.